ABSTRACT

An Implantable Medical Device (IMD) for controllably releasing a biologically-active agent such as a drug to a body is disclosed. The IMD includes a catheter having one or more ports, each of which is individually controlled by a respective pair of conductive members located in proximity to the port. According to the invention, a voltage potential difference generated across a respective pair of conductive members is used to control drug delivery via the respective port. In one embodiment of the current invention, each port includes a cap member formed of a conductive material. This cap member is electrically coupled to one of the conductive members associated with the port to form an anode. The second one of the conductive members is located in proximity to the port and serves as a cathode. When the cap member is exposed to a conductive fluid such as blood, a potential difference generated between the conductors causes current to flow from the anode to the catheter, dissolving the cap so that a biologically-active agent is released to the body. In another embodiment of the invention, each port is in proximity to a reservoir or other expandable member containing a cross-linked polymer gel of the type that expands when placed within an electrical field. Creation of an electric field between respective conductive members across the cross-linked polymer gel causes the gel to expand. In one embodiment, this expansion causes the expandable member to assume a state that blocks the exit of the drug from the respective port. Alternatively, the expansion may be utilized to assert a force on a bolus of the drug so that it is delivered via the respective port. Drug delivery is controlled by a control circuit that selectively activates one or more of the predetermined ports.